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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/687,186	10/16/2003	Sergey D. Lopatin	039153-0484 (G1190)	7567

26371 7590 04/13/2006

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EXAMINER	
NGUYEN, THANH T	

ART UNIT	PAPER NUMBER
2813	

DATE MAILED: 04/13/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/687,186	LOPATIN ET AL.	
	Examiner	Art Unit	
	Thanh T. Nguyen	2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *1/30/06*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

Applicant's arguments with respect to claims 1-20 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-4, 7-16, 18-20 are rejected under 35 U.S.C. 102(e) as being anticipated by Asahina et al. (U.S. Patent No. 6,429,493).

Referring to figures 1-7, Asahina et al. teaches a method of using an adhesion precursor in an integrated circuit fabrication process, the method comprising:

Forming a trench (22, see figure 1) in a dielectric layer (20)

Providing a first gas over a dielectric material (20) to form a continuous barrier adhesion precursor layer (29, see figure 4, col. 5, lines 46-63, col. 11, lines 36-38, depositing the layer by

using CVD ones has to use gas for deposition) above the dielectric layer and along sides of the trench;

Providing a second gas including an alloy agent over the adhesion precursor layer (29) to provide a copper layer over the continuous barrier layer, the copper located in the trench forming an integrated circuit feature (36a, see figure 7, col. 8, lines 62-67, col. 9, lines 1-14, see col. 11, lines 36-39, depositing the layer by using CVD ones has to use gas for deposition).

Regarding to claim 2, the adhesion precursor layer includes a barrier material (see figures 3-5, col. 5+, lines 45+).

Regarding to claims 3, 11, 18, the adhesion precursor layer has a thickness of 10-100 angstrom (see col. 4, lines 46-47).

Regarding to claim 4, providing a second gas of a second material over the adhesion precursor (33, see figure 5, col. 6, lines 19-52, col. 11, lines 36-39, depositing the layer by using CVD ones has to use gas for deposition).

Regarding to claim 7, providing a third gas material over a layer formed by the second gas (35, figure 5, col. 7, lines 49-53, see col. 11, lines 36-39, depositing the layer by using CVD ones has to use gas for deposition), wherein third gas includes an alloy element (see col. 3, lines 57-61, noted that at least one can be two conductive gas which forms an alloy).

Regarding to claim 8, 12, an alloy agent gas over the adhesion precursor layer (32/33/34/35, figure 5, col. 7, lines 49-53, see col. 11, lines 36-39, depositing the layer by using CVD ones has to use gas for deposition), wherein third gas includes an alloy element (see col. 3, lines 57-61, noted that at least one can be two conductive gas which forms an alloy).

Regarding to claim 13, 20, the adhesion precursor layer includes a material being selected from a group consisting of tantalum nitride, tungsten nitride, or disilicon nitride (33, see col. 6, lines 39-40).

Regarding to claim 14, the alloy layer has thickness of up to 50 Angstroms (35, figure 5, col. 7, lines 49-53, see col. 11, lines 36-39, see col. 3, lines 57-61).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 5-6, 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Asahina et al. (U.S. Patent No. 6,429,493) as applied to claims 1-4, 7-16, 18-20 above in view of Eldelstein et al. (U.S. Patent No. 6,181,012).

Referring to figures 1-7, Asahina et al. teaches a method of using an adhesion precursor in an integrated circuit fabrication process, the method comprising:

Forming a trench (22, see figure 1) in a dielectric layer (20)

Providing a first gas over a dielectric material (20) to form a continuous barrier adhesion precursor layer (29, see figure 4, col. 5, lines 46-63, col. 11, lines 36-38, depositing the layer by using CVD ones has to use gas for deposition) above the dielectric layer and along sides of the trench;

providing a second gas of a second material over the adhesion precursor (33, see figure 5, col. 6, lines 19-52, col. 11, lines 36-39, depositing the layer by using CVD ones has to use gas for deposition).

provide a copper layer over the continuous barrier layer, the copper located in the trench forming an integrated circuit feature (36a, see figure 7, col. 8, lines 62-67, col. 9, lines 1-14, see col. 11, lines 36-39, depositing the layer by using CVD ones has to use gas for deposition).

Regarding to claim 6, Regarding to claim 7, providing a third gas material over a layer formed by the second gas (35, figure 5, col. 7, lines 49-53, see col. 11, lines 36-39, depositing the layer by using CVD ones has to use gas for deposition), wherein third gas includes an alloy element (see col. 3, lines 57-61, noted that at least one can be two conductive gas which forms an alloy).

However, the reference does not teach forming a second gas includes tin (Sn), and CMP to level the copper to substantially the same level as the barrier above the dielectric layer.

Edelstein et al. teaches forming a barrier layer (72), forming a second gas of a second material (76) over the adhesion precursor layer (72), wherein the second gas includes tin (Sn, see col. 9, lines 66-67), forming a copper alloy layer (56) by using chemical vapor deposition to deposit on the barrier/adhesion layer (72), then planarizing the layer by CMP (see figures 4a-4d, col. 9, lines 48-67, col. 10, lines 1-14).

Therefore, it would have been obvious to a person of ordinary skill in the requisite art at the time of the invention was made would form a layer copper alloy form the alloy agent in process of Asahina et al. as taught by Edelstein et al. because the copper alloy layer would

increase the hardness of copper film and also reduce electromigration and CMP to provide a planar surface.

The additional references cited in form PTO-892 show further analogous circuitry. Specifically references (Marsh et al. (6,461,909), Anand et al. (6,307,265)) are particularly relevant to claimed device and manufacture which recited in claims 1-20. These references are deemed relevant and should be carefully reviewed before any amendment is filed.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanh Nguyen whose telephone number is (571) 272-1695, or by Email via address Thanh.Nguyen@uspto.gov. The examiner can normally be reached on Monday-Thursday from 6:00AM to 3:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, can be reached on (571) 272-1702. The fax phone number for this Group is (571) 273-8300.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0956 (**See MPEP 203.08**).

Thanh Nguyen
Patent Examiner
Patent Examining Group 2800